

ingly tender, that it is difficult to carry it home in a condition fit for preservation. It differs from *Dickieia ulvoides* in its darker colour, divided frond, and more tapering extremities; besides, it is an autumnal and the other a vernal species.

PLATE V. fig. 6. Frond of *Dickieia pinnata*, natural size.

#### Note on SPIRULINA.

Professor Kützing has described and figured eleven species of this genus, but the specific differences which he relies on do not seem to me satisfactory. They are chiefly the colour of the stratum and comparative closeness and diameters of the spires or coils. But the colours I have found to vary much, according to the age of the stratum, its greater or less exposure to light, and the state of the weather. In all the specimens whose growth I have watched, the spires were at first very dense, but became laxer after a short time; and in a specimen of *Spirulina tenuissima* sent me from Bristol by Mr. Thwaites, the spires were relaxed at the extremities of many of the filaments, though at the middle they remained compact. In *Spirulina* the diameters of the filaments increase considerably as they advance towards maturity, but this increase has its limits, and an acquaintance with all the species is necessary to enable the observer to determine what value he should assign to this character as a specific distinction.

PLATE V. fig. 5. Filament of *Spirulina tenuissima*, having laxer spires at its extremities.

#### XX.—*A few Remarks upon the Crag of Suffolk.*

By W. B. CLARKE, M.D., of Ipswich.

IN the 'Philosophical Magazine' for August 1835 Mr. Edward Charlesworth published some papers upon the Crag of Suffolk and Norfolk, in which he divided the formation into three successive deposits. The oldest, from the abundance of zoophytes contained within it, he termed the *Coralline Crag*. The second, from the peculiar red or ochreous colour which pervades it, produced by the presence of hydrous oxide of iron, he termed the *Red Crag*, which is characterized by the dying-out or absence of a great proportion of zoophytes and the introduction of new groups of testacea. The third, from its containing many fossil remains of mammalian animals, he termed the *Mammaliferous Crag*.

The representatives of these groups may be seen as follows:—

#### *Miocene Group.*

Coralline Crag of England: Loire and Gironde in France; containing 17 per cent. of recent species.

*Pliocene Group.*

Red Crag of England : Subapennine Hills ; containing from 35 to 50 per cent. of recent species.

*Pleistocene Group.*

Mammaliferous Crag of England : Sicilian deposits ; containing from 90 to 95 per cent. of recent species.

Since the publication of these characteristics of the Crag, extensive excavations have been made within it in several localities between the rivers Orwell and Deben, and on the banks of the latter, in which many interesting discoveries have been made in the organic remains of the deposit.

The above-mentioned excavations have shown that above the London clay and beneath the Red Crag, extending over certain spaces, a bed is found varying in thickness from 3 or 4 inches to about a foot and a half, consisting of fragments of bone, usually of flattened form, with their ends and edges rounded by attrition, interspersed amongst numerous irregularly-formed, more or less rounded nodules, which appear to be indurated clay : some of these latter exhibit an irregular cleavage in angular fragments, the inner surfaces of which show the presence and infiltration of phosphates and carbonates of iron. Amongst these are found others exhibiting a concentric structure, exposing and disintegrating the contiguous layers of which the nodule consists. Some of these appear to owe their origin to a nucleus of organic matter, as a vertebra, a tooth, a shell, a small branch of wood, or some other substance around which the argillaceous layers have accumulated. Others exhibit a minute structure corresponding in character with the usual appearance of septaria from the London clay, having the interstices of the clay filled with carbonate of lime frequently tinged by phosphate of iron. These nodules not only abound in the stratum beneath the Red Crag, but are also dispersed in various directions throughout the general mass without any disposition to stratification, showing they have been deposited promiscuously during the whole of the Red Crag period, or whilst that deposit was being formed.

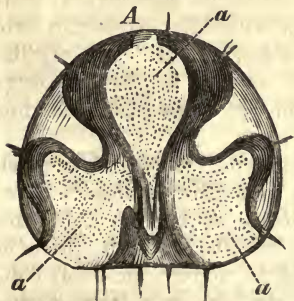
Again, we find arenaceous clay nodules that have been rounded by attrition into forms more or less spherical, upon breaking which a shell, frequently a bivalve, is found in the interior, having served as a nucleus around which the argillaceous substance has consolidated : in some instances the shell itself is found ; in others nothing but the cast of it remains. It is not unlikely that the presence of the shell and its molluscous inhabitant involving certain chemical changes within the mass of clay

may have given rise to the consolidation of the surrounding mass, so as to have prevented disintegration at the time of its removal from its former bed and the act of rolling previous to its subsequent deposit in the Crag.

Many of the nodules found in the Crag appear to have originated in causes similar to those in operation at the present day, where masses of cliff have fallen and broken into fragments of various sizes; these subsequently, having been rolled along the beach and amongst each other by the action of the waves, have been rounded into the forms they now assume. Clay nodules of similar shape, but in a soft state, are frequent upon the Suffolk and Essex beaches, where the clay cliffs are disintegrating at the present day by the inroads of the sea.

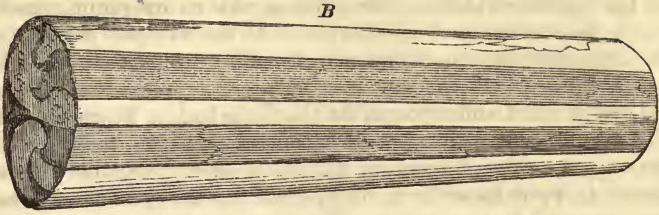
Fragments of clay bored by Pholades, and wood by Teredines, are found in this Crag deposit.

Within this formation have been discovered an interesting collection of remains of several species of mammalian and other animals, consisting of flat portions of bones, apparently ribs of large quadrupeds, which subsequently to their fracture have been rounded by attrition at their ends and edges; with these are found various other bones and teeth of Elephants, Mastodon and Rhinoceros, teeth of Bears, and fragments of the extremities of small quadrupeds, but which are often so much disfigured by fracture and subsequent rolling that it is difficult to identify and associate them with living forms. The antlers of several species of Deer, some of large size, nearly allied to, if not identical with, the Megaceros or "Giant Elk of Ireland:" the tympanic or auditory bones, teeth, and other parts of several species of Whale and Cachalot, amongst which may be mentioned a fragment of considerable interest of the anterior part of the head or nose of a long-nosed Cetacean allied to *Macrorhinus*, which has been examined by Prof. Owen with much interest. The accompanying figure is a representation of it.



A. Transverse section of nose of a long-nosed Cetacean from the Red Crag of Suffolk.

The figure is of the nat. size: *a, a, a*, is matrix, an arenaceous mass which has been washed into the interior.



B. Longitudinal view of the same fossil, half the natural size.

All these fossils are in a highly mineralized state, apparently produced by the ferruginous particles contained within the Crag, in conjunction with certain peculiar conditions of the fossil itself.

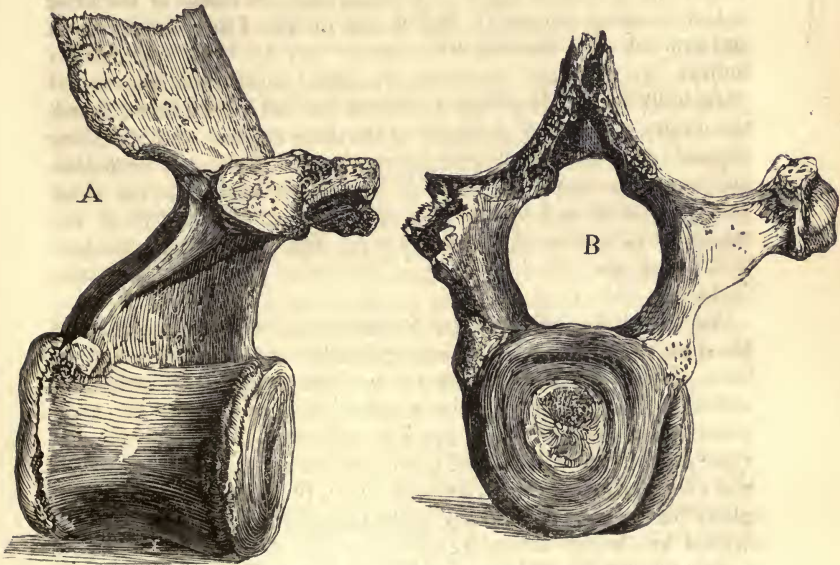
With the above are also found teeth and vertebræ of several species of fish allied to Sharks, some extremely large, as the *Carcharodon megalodon*: the spines, tubercles, and teeth of Rays, some of which are completely mineralized, and others not, but partaking of the condition of the generality of fossils of the Crag epoch: amongst these are found specimens of fish derived from the London clay, surrounded more or less by their argillaceous matrix. In the same condition are found short- and long-tailed (Brachyurous and Macrurous) crustaceans all highly mineralized, the greatest amount of which occur beneath the general Crag deposit; but in various parts throughout the Red Crag formation are found the claws of Crabs in the usual condition of the Crag fossils, without any appearance of mineralization, but in an extremely friable state from their having lost their animal matter: with these are associated spines of Echini and flints from the Chalk.

As the mammalian remains contain a large proportion of phosphate of lime, considerable interest has been attached to them of late: the Crag has been laid open, carefully overlooked, and these remains collected and preserved for agricultural purposes after having been ground to powder and converted into superphosphates by digestion in sulphuric acid. The argillaceous nodules when thus ground are said to be used in large quantities in the adulteration of guano and bone-dust, and thus applied by the agriculturist.

At intervals are found beds of ferruginous clay nodules, which upon being broken present a highly mineralized crust or exterior, containing a pulverulent ochreous substance; these are usually of a flattened form, and lie parallel with the plane of stratification. The mineralization of these nodules probably continues to the present time through the agency of ferruginous matter involved in the Crag.

This appears evident in the process now in operation, resulting in the formation of columnar concretions upon the face of the Crag, through the chemical and mechanical agency of water as it trickles down the vertical surface, carrying with it small portions of sand and comminuted shells, which it deposits generally in a stalactitic form, the ferruginous particles held in solution in the water cementing the mass firmly together: these abound in some localities in which the Crag is exposed, and have been regarded by the uninitiated as fossil antlers, and have been gravely collected and treasured as such. These substances vary in diameter from 2 inches to the eighth of an inch, and are variously contorted or branched.

Within a short time a fragment of a jaw, apparently of a large Cetacean nearly equal in size to the Greenland Whale, has been discovered in the Coralline Crag, and the remains of other species of the same tribe of creatures have been found in the same deposit. The accompanying xylographs represent two of these fossils.



A. lateral view, and B. posterior view of a dorsal vertebra of a Cetacean from the Coralline Crag of Suffolk.

A and B are two figures of a dorsal vertebra of a Cetacean, allied to the Grampus, discovered in the Coralline Crag at Orford in Suffolk: the specimen is in fine condition, but a portion of the spinous process and part of one of the transverse processes were

injured in the act of removing it from the deposit in which it was found.



C.

Caudal vertebra of a Cetacean from the Coralline Crag of Suffolk.

C represents the body and transverse processes of a caudal vertebra of a Cetacean, also found in the Coralline Crag of Suffolk.

In addition to the above-mentioned organic remains are the numerous interesting and beautiful species of Testacea which abound in the several divisions of the Crag deposit, and which are now so much sought after as objects of great interest to geologists and the "general collectors" of the neighbourhood, and which are so ably described and figured by Messrs. S. V. Wood and Sowerby in the works recently published by the Palæontographical Society.

In reference to the various fossils discovered in the Crag, and which are derived from other formations, it will be remembered that by the action of the sea and other causes, deposits previously formed are broken up and large quantities of such material are transported, in some instances to very great distances, examples of which are observed everywhere around us in the 'gravel' or 'till': and there are accumulations forming in the German Ocean at the present time, from the 'debris' of various parts of the shores of England, Scotland and the continent, which are being driven together by the continuous agency of currents, and thus, for instance, are carried into the same deposit, the chalk of Kent; the London clay, crag and upper tertiary of Essex; clay, crag and chalk of the Suffolk and Norfolk coasts; chalk, oolite and lias of Yorkshire; magnesian limestone of Durham; sandstone and coal of Northumberland; together with the trap and plutonic rocks of Scotland; all of which are associated with the tertiary and other deposits from

the continent, and with the remains of recent species that inhabit these coasts, in conjunction with parts of recent land and freshwater animals and plants which are carried amongst them by the currents of various rivers that are discharging their contents into these seas: disintegration is continually occurring, and masses of 'rocks,' with or without their organic contents, are annually being swept into the sea and deposited at various depths beneath its surface, frequently burying hosts of living forms amongst them.

Berners Street, Ipswich, August 16, 1851.

## PROCEEDINGS OF LEARNED SOCIETIES.

### ZOOLOGICAL SOCIETY.

June 11, 1850.—W. Spence, Esq., F.R.S., in the Chair.

SYNOPSIS OF THE SPECIES OF ANTELOPES AND STREPSICERES, WITH DESCRIPTIONS OF SOME NEW SPECIES. BY J. E. GRAY, ESQ., F.R.S., P.B.S. ETC.

[Concluded from p. 146.]

2. The CERVINE ANTELOPES have an elongated tail, cylindrical at the base, and with long hair at the end, often forming a compressed ridge; the body heavy and the limbs strong. They are of a large size.

A. Neck not maned.

#### 18. ADENOTA.

Muffle cordate, moderate, cervine; nose hairy between the back of the nostrils; horns sublyrate, ringed, when young rather recurved; place of tear-bag covered with a tuft of hair; hair of the back whorled, of dorsal line and back of head reversed; tail elongate, hairy.

This genus is very like *Eleotragus*, but has a smaller, more cervine muzzle and lyrated horns; it differs from *Cobus* in the form of the tail, and wanting the mane, and from both in having a tuft of hair in the front of the orbit.

\* Horns sublyrate; tail hairy.

#### 1. ADENOTA KOB. The ÆQUITOON.

Pale brown; end of nose, inside of ears, chest, belly, inside of legs and thighs, tip of tail, and band above hoofs white; front of fore and hind legs, and end of ears and tail black; hair of the dorsal line reversed, with a whorl on the shoulders and loins.

*Antelope Kob*, Erxl. from *Kob*, Buffon, H. N. xii. t. 32. f. 1? —*Kobus Adansonii*, A. Smith, from Buffon.—*Gambian Antelope*, Penn. Syn. 39, from Buffon.—*A. adenota*, H. Smith, G. A. K. iv. 224. t. 184. and t. 183. f. 3, 4. horns?

*A. Kob*, Ogilby, P.Z.S. 1836.—*A. annulipes*, Gray, Ann. and Mag. Nat. Hist. 1843.—*Adenota Kob*, Gray, Knows. Menag. 14. t. 14, 15.

*Var.* Female, hair longer, sides of face whitish.